# NISTTech

## THREE DEGREE-OF-FREEDOM TELESCOPING GEOMETRY SCANNER

**Generate accurate 3D images of work sites without line of site limitations**

## Description

This 3-degree-of-freedom scanning device is linked to a GPS for creating precise 3-dimensional stereo range images. The laser source and range determination electronics are located in an environmentally secure chamber at one end of a hollow telescoping nested mast. The sensing head is capable of being rotated a full 360 degrees about a longitudinal centerline of the extension mast tube by a precision encoding system which provides real time feedback on the angular orientation of the sensing head relative to a reference position on the telescoping mast system. A multi-faceted precision rotating mirror deflects the ranging laser pulse/beam towards a presumed non-cooperative target scene point. The light reflected from the target point is picked up by the rotating mirror and returned down the hollow core of the telescoping mast where it is sensed by the ranging element receiver.

Uses for three-dimensional metrology are expanding rapidly. In the construction industry the immediate impediment to the effective use of scanning technology is line of sight limitations. There is no present ability to look over or around the obstacle. This problem also extends to the interior of buildings thereby preventing the development of as-built scans. Because of the critical nature of the work in the nuclear industry, workers cannot depend upon the accuracy of shop drawings. In addition, high levels of radioactivity prevent long-term exposure by workers. Surveying is impossible because of the limited space available for equipment and instruments.

## Applications

- **Construction**
  Effective in sites having line of sight limitations; works in conjunction with GPS
- **Remodeling or retrofitting**
  Able to create as-built scans
- **Rehabilitation of nuclear contaminated sites**
  Avoids worker exposure in hot cells.

## Advantages

- **As-built imaging**
  Overcomes line of sight problems associated with hot cells and construction sites
- **Compact, inexpensive, and simple design**

## Abstract

The invention relates to a three-dimensional measuring device, comprising a rotating 360 degree sensor head, a laser scanner and an extendable mast system. The sensor head contains a 360 degree rotating multi-faceted mirror, which determines total path distance from the laser scanner to a particular target. Angular orientations on both the scanner and the faceted mirrors are calculated by a precision encoding system. The measured total path distance, mast system extension, scanner head rotation, mirror rotation angles, and mast deflection are all used to calculate the location of a target point in 3-D space relative to the scanner. The sensing device can be utilized in the construction and nuclear power areas. In the nuclear power area, the mast system can be extended into a contaminated area which the sensor remains outside the contaminated area, thereby avoiding contamination problems.

## Inventors

- Stone, William C.

## References

- U.S. Patent # 6,600,553 expired 08-29-2011 due to non-pmt of maint fees
- Docket: 99-002US

## Status of Availability

This technology is available in the public domain.

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